

IN THE CLAIMS:

1. (currently amended) A process liquid filtration apparatus embodying a filter bed for removing particulates from a process liquid having a predetermined specific gravity comprising,

a filter bed comprised of super-buoyant particles having a specific gravity lower than one half of the predetermined specific gravity of the process liquid, said super-buoyant particles are selected to be a specific size within the range of 0.1 micron to less than 1.0 mm

a pump adapted to provide a process fluid pressure of from approximately 20 to 150 psi for the process liquid to flow through said filter bed;

a bed support adapted to restrain said super-buoyant particles and resist the process fluid pressure required to move said process liquid through said filter bed at said pressure; and

a backwash system effective for removing contaminants from said super-buoyant particles.

2. (previously presented) The filtration apparatus according to Claim 1, wherein said super-buoyant filter bed particles are loosely compacted and a majority of their mass floats on top of the process liquid to be filtered.

3. (previously presented) The filtration apparatus according to Claim 1 wherein said mass of super-buoyant filter particles is sufficiently loosely compacted to enable backwashing of the filter bed as the mass of filter particles floats on a body of process liquid.

4. (canceled).

5. (canceled).

6. (previously presented) The filtration apparatus according to Claim 3, wherein said mass of super-buoyant filter particles expands in volume from about 10 to 30% during said backwashing to thereby free captured particulates and washing them out of the filter bed.

7. (previously presented) The filtration apparatus according to Claim 1, wherein said super-buoyant filter bed particles are selected from a group consisting of plastic, glass or ceramic.

8. (canceled).

9. (canceled)

10. (original) The filtration apparatus according to Claim 1, wherein said filtration apparatus includes an ultraviolet reactor, said process liquid is caused to flow through said ultraviolet reactor to be exposed to a high flux of ultraviolet radiation to induce the formation of hydroxyl ions in the process liquid which combine with ionized metals in said process fluid to form insoluble precipitate particles, whereupon said process liquid bearing said precipitated particles is pumped through said filter bed to remove said precipitated particles.

11-20. (Canceled)

21. (currently amended) A liquid filtration apparatus for removing particulates from a process liquid having a predetermined specific gravity, comprising:

a) a source of said particulate laden process liquid;

b) a filter chamber having an inlet port for receiving said particulate laden process liquid and an outlet port for discharging filtered process liquid therefrom;

c) a composite filter bed within said filter chamber formed by distinct super-buoyant filter particles having a specific gravity lower than one half that of the said predetermined specific gravity of said process liquid, said super-buoyant filter particles are selected to be a specific size within the range of 0.1 micron to less than 1.0 mm;

d) means for conveying particulate laden process liquid into said filter chamber from said source thereof for passage through said composite super-buoyant filter bed for separation of said particulates from said process liquid and discharge of filtered process liquid through said outlet port of said filter chamber;

e) means communicating with said outlet port for conveying said filtered process liquid away from said filter chamber for re-use as a non-contaminated process liquid;

f) a pump adapted to provide a process fluid pressure of from approximately 20 to 150 psi for the process liquid to flow through said filter bed;

g) a bed support adapted to restrain said super-buoyant particles and resist the process fluid pressure required to move said process liquid through said filter bed at said pressure; and

h) a backwash system effective for removing contaminants from said super-buoyant particles.

22. (original) The liquid filtration apparatus according to Claim 21, wherein a storage reservoir is provided having an inlet port to selectively receive filtered process liquid from said filter chamber and an outlet port for selectively delivering filtered process liquid back to said filter chamber for backwashing said composite filter bed to remove particulates therefrom.

23. (original) The liquid filtration apparatus according to Claim 22, wherein a storage reservoir is provided connected to said inlet port of said filter chamber to selectively collect particulate contaminated process liquid from said filter chamber following backwashing of said composite filter bed to remove said particulates.

24. (original) The liquid filtration apparatus according to Claim 21, wherein control means are provided selectively operable to control the delivery of particulate contaminated process liquid to and from said filter chamber and to control the discharge of filtered process liquid from said filter chamber.

25. (original) The liquid filtration apparatus according to Claim 21, wherein means are provided within said filter chamber for preventing said super-buoyant filter bed particles from being discharged from said filter chamber.

26. (original) The liquid filtration apparatus according to Claim 21, wherein said filter chamber is provided with a normally closed vent tube communicating the interior of said filter chamber to the atmosphere and selectively opened when particulate contaminated process liquid

is drained from said filter chamber following backwashing of said composite filter bed to remove contaminating particulates therefrom.

27. (original) The liquid filtration apparatus according to Claim 21, wherein at least one backwash spray head is mounted within said filter chamber, means connecting said at least one backwash spray head to the outlet port of said filter chamber to convey filtered process liquid from said filter chamber to said at least one backwash spray head, and means interposed in said means connecting said at least one spray head to said filter chamber selectively operable to initiate conveyance of said filtered process liquid to said at least one spray head when said super-buoyant filter bed is so clogged by particulates that the rate of flow of said filtered process liquid drops below a selected predetermined flow rate, whereby said filter bed is backwashed to remove said particulates therefrom.

28. (original) The liquid filtration apparatus according to Claim 27, wherein said means responsive to said reduced flow rate from said filter chamber includes a sensor that measures said flow rate, a plurality of solenoid operated valves, a filtered process liquid reservoir, a pump and an electronic control system interconnecting said sensor, valves, reservoir and pump.

29. (original) The liquid filtration apparatus according to Claim 21, wherein dual filter chambers are provided connected in a parallel flow filtration system configuration.

30. (original) The liquid filtration apparatus according to Claim 29 wherein control means are provided operable to retain one filter chamber in filtering operation while the filter

bed of the other filter chamber is being backwashed, whereby said particulate contaminated process liquid may be filtered continuously without interruption.

31. (original) The liquid filtration apparatus according to Claim 28, wherein dual filter chambers are provided connected in a parallel flow filtration system configuration, and said electronic control system comprises an embedded microprocessor operable to monitor said sensors and to turn "ON" and "OFF" in a timely manner all of the pumps and valves required to operate the dual filter chamber apparatus.

32. (original) The liquid filtration apparatus according to Claim 21, wherein dual filter chambers are provided connected in a series flow filtration system configuration wherein a first of said filter chambers is the primary filter chamber and a second of said filter chambers is the secondary filter chamber.

33. (original) The liquid filtration apparatus according to Claim 32, wherein the outlet port of said primary filter chamber is connected to the inlet port of said secondary filter chamber, the outlet port of said secondary filter chamber is selectively connected to deliver filtered process liquid to said primary and secondary chambers to effect backwashing of the composite filter beds in said dual chambers, and an electronic control system is provided interconnecting said series flow filter chambers whereby the filter beds in said series-connected filter housings may be composed of particles sized to filter coarse particulates from process liquid passing through said first filter chamber and composed of particles sized to filter finer particulates from the process

liquid admitted to said secondary filter chamber to thus maximize the total amount of contaminant particulates removed by liquid filtering apparatus.

34. (original) The liquid filtration apparatus according to Claim 33, wherein a hydroxyl ion-generating ultraviolet reactor is interposed between said primary and secondary filter chambers, said filtered process liquid discharged from said primary filter chamber flows through said ultraviolet reactor and is exposed to a high flux of ultraviolet radiation in flowing therethrough which induces the formation of hydroxyl ions in the process liquid which combine with ionized metals in the process liquid to form insoluble precipitate particles which flow into the secondary filter chamber to be captured by said composite super-buoyant filter bed and filtered from the process liquid flowing through said secondary filter chamber.

35. (previously presented) The liquid filtration apparatus according to anyone of Claims 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33 or 34, wherein said composite super-buoyant filter bed particles are selected from a group consisting of plastic, glass or ceramic.

36. (original) The liquid filtration apparatus according to anyone of Claims 21, 29 or 32, wherein each said filter chamber is symmetrical about a vertical axis, said inlet and outlet ports are coincident with said vertical axis, said composite super-buoyant filter bed is initially contained within said filter chamber adjacent said inlet port and buoyantly floats upwardly on said process liquid to adjacent said outlet port by the process liquid admitted into said chamber through said inlet port and floats downwardly on the surface of said process liquid when said

process liquid is drained from said filter chamber in preparation of backwashing said composite filter bed and subsequently floats upward during said backwashing cycle.

37. (previously presented) The filtration apparatus of Claim 1, wherein said process liquid is water or a water-based process liquid and said super-buoyant particles are hydrophobic super-buoyant particles.

38. (previously presented) The filtration apparatus of claim 1, wherein said super-buoyant particles are spherically shaped particles.

39. (previously presented) The filtration apparatus of claim 1, wherein said bed support is a multi-layered support comprising a perforated metal plate and two or more layers of screen.

40. (previously presented) The filtration apparatus of claim 1, wherein said bed support is a multi-layered support comprising a perforated metal plate, a layer of screen, and a layer of semi-permeable material.

41. (previously presented) The filtration apparatus of claim 1, wherein said backwash system includes at least one spray nozzle located below said bed support.